



A Cold Connection

The Relationship of Rainbow Smelt and Coldwater Habitat in Sakakawea

By Jason Lee

While these small rainbow smelt might not look like much in a net, they are the main forage fish for most sport fish - walleye included - in Lake Sakakawea. But in order to thrive in the reservoir, these silver prey need coldwater habitat, something that will likely be in short supply this summer because of declining water levels. When Sakakawea water levels drop below 1,825 feet above mean sea level in the summer, the amount of coldwater habitat reaches levels that can hurt coldwater fish populations. Forecasts call for lake levels to start out this summer well below that mark.

The thinking that coldwater habitat in Lake Sakakawea only concerns salmon just isn't true. Coldwater habitat is important to the lake's entire fishery, no matter what species of fish you pursue.

What is coldwater habitat? In Sakakawea, coldwater habitat is water that's 59 degrees F., or colder, that contains adequate dissolved oxygen.

Some fish species that live in Lake Sakakawea are considered "coldwater" fish and require this habitat to survive. First and foremost are rainbow smelt.

Although not typically sought by anglers, rainbow smelt are the main forage for most of the sport fish – walleye,

sauger and salmon. Smelt are a small, slender, silvery-colored fish that reach lengths of 4-8 inches as adults in Sakakawea. While small on an individual basis, smelt as a whole make a big contribution to the system.

During years of low water in Sakakawea, coldwater habitat can become limited. During summer months, the lake warms and becomes temperature stratified. That is, the upper portion of the water column contains warmer water and the lower portion colder water. The line where these two meet is called the thermocline.

Typically, the thermocline drops in the water column as summer progresses,

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decreasing the amount of coldwater habitat. At the end of August or by mid-September, coldwater habitat usually reaches its lowest level.

Cooler night air temperatures during fall cause surface water temperatures to drop. Eventually, this gradual fall cool-down causes the lake to “turn over,” or mix, throughout. This usually occurs in October and results in a uniform reservoir water temperature.

In typical water years, Lake Sakakawea has plenty of coldwater habitat. However, in years when the lake elevation drops below 1,825 feet above mean sea level during summer, the amount of coldwater habitat reaches levels that can be detrimental to coldwater fish populations. A combination of higher water temperature and lower oxygen stress smelt and salmon, causing poor growth, condition, and even survival. When this stress period exists for an extended period of time, fish can die.

Since 1990, the North Dakota Game and Fish Department and the State Health Department have collected data to monitor the amount of coldwater habitat in Lake Sakakawea. This is done by taking temperature and dissolved oxygen measurements at several locations throughout the reservoir. Several years of monitoring showed a decline in coldwater habitat in 1990, 1991, 1992 and 2002.

Three of four years were during the drought of 1988 through 1992. In 1990, coldwater habitat was estimated at only 65,000 acre feet. The lake elevation during this time was also at a low level of 1,821 msl, and a major summer smelt die-off – the only one on record – occurred in the middle section of the lake.

In 2002, coldwater habitat in Sakakawea also reached levels where bad things can happen to coldwater fish.

A relationship exists between coldwater habitat and lake elevation. That is, as lake elevation decreases, the amount of coldwater habitat generally decreases. Other factors such as flows into and out of the lake, and air temperature, also affect the amount of coldwater habitat. For instance, in 2001, lower than normal releases from Sakakawea conserved a considerable amount of coldwater habitat.

In 1999, a hydroacoustic

survey was initiated to estimate rainbow smelt populations in Lake Sakakawea. Hydroacoustics uses the same technology as fish locators, or fish finders, only on a much larger scale. Areas throughout the reservoir are surveyed in August to estimate a total smelt population.

Findings from the surveys showed a major decline in smelt abundance from 2001 to 2002. The estimated biomass of smelt decreased from 831,000 kilograms in 2001 to 103,000 kg in 2002.

The decline is related to a few factors. First was a reduction of available coldwater habitat in Lake Sakakawea in 2002, which dropped from more than 2.5 million acre feet in 2001 to 1.2 maf in 2002, a loss of more than half the lake’s coldwater habitat in one year.

Another likely factor is related to primary productivity in Lake Sakakawea. Primary productivity – nutrients and

plankton – is critical to survival and growth of smelt, which, in turn, are vital for supporting the lake’s recreational fishery. Flooding of established shoreline vegetation every two or three years can stimulate a trophic upsurge, increase productivity, and produce strong year classes of fish. Lake Sakakawea’s elevation has been in a downward cycle for the past three years with little or no time when terrestrial shoreline vegetation was flooded.

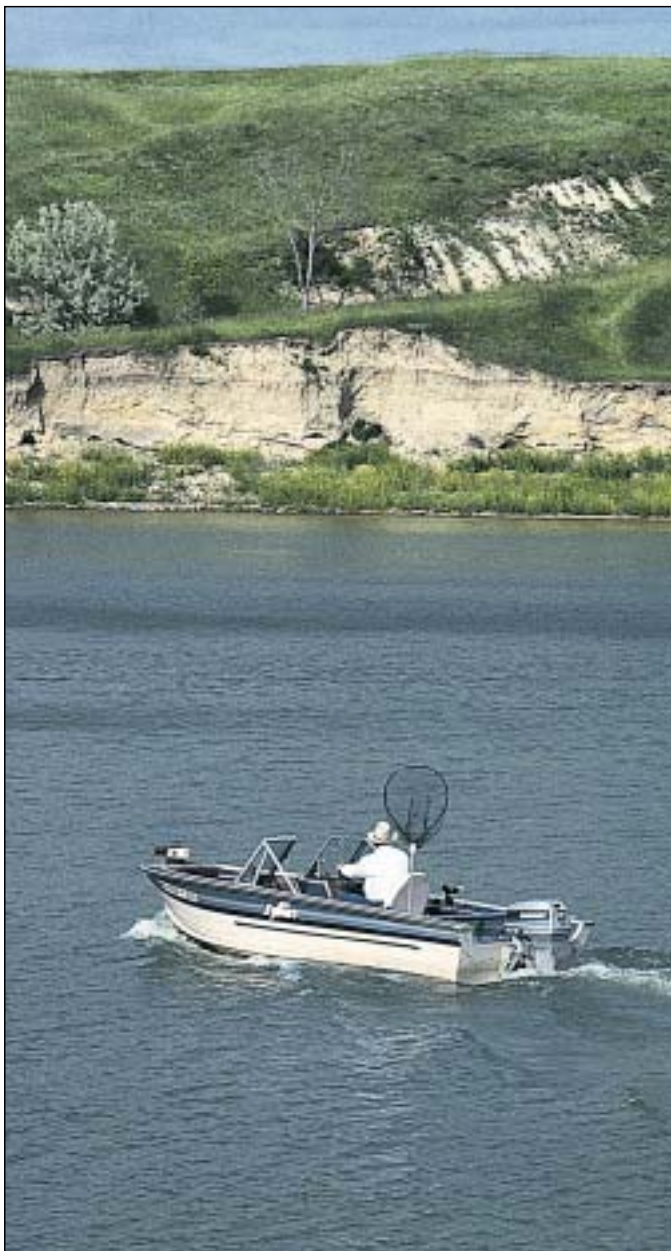
The third factor is the cyclic tendency of smelt populations. Smelt across the United States are subject to cycles. It’s just the nature of the species. Unfortunately, in the case of Lake Sakakawea, continued low lake elevations will likely result in a “bust” rather than a “boom” end of the cycle.

So, what does the future hold for fishing in Lake Sakakawea? Current projections for this year’s lake levels are a concern. Water levels may reach those of 1990, or even lower, in 2003. Dropping lake elevations could lead the smelt population into a bust. Because of a lower food base – something that could take years to recover – fish will be hungry and fishing could be good.

The good news is that smelt reproduction during 2002 was very good and Lake Sakakawea harbors a good number of young smelt. Still, that progeny will need coldwater habitat this summer to survive.

Mother Nature can drastically change water levels in the reservoir in a short time. This was the case when Sakakawea refilled during the summer of 1993 after the last drought. But a continued drop in Sakakawea’s elevation will not bode well for this popular North Dakota fishery.

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Anglers need to understand that Lake Sakakawea’s coldwater habitat – water 59 degrees or colder – is important to more than the reservoir’s salmon population. When coldwater habitat is lost, smelt can die, robbing walleye, sauger and other species of a major food source. According to years of studies by Game and Fish Department biologists, smelt made up 91 percent of what walleye eat.
